The Application of Big Data in Enterprise Information Intelligent Decision-Making

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ABSTRACT With the continuous increase of mass information in the process of enterprise operation, information redundancy interference poses a challenge to enterprise information decision-making. Therefore, this paper applies big data analysis technology to enterprise information intelligent decision-making, and builds an enterprise information intelligent decision-making model based on big data analysis. The key data of enterprise is mined by using the density weight Canopy to improve the K-Gmedoids algorithm. After sorting, filtering, and transforming, the big data model designed in this paper uses interactive genetic algorithms to obtain the optimal decision-making strategy of enterprise information through experimental tests, which has a significant impact on the decision-making management and the competitiveness of the enterprise. In the process of enterprise information collection and intelligent decision-making, the interactive genetic algorithm generates a 95% match between the optimal business operation plan and the problems that need to be solved in the actual operation of the enterprise, which can better improve the ability of the enterprise to deal with problems. The number of iterations of the optimal decision-making plan obtained by the company is only 6 times, which has a good use effect while improving work efficiency.

INDEX TERMS Big data, the enterprise information, intelligent, decision-making, cluster, interactive genetic.

I. INTRODUCTION

With the continuous development of cloud computing technology, the application of the Internet of things and mobile Internet has gradually increased, and the management work in various fields is inseparable from big data technology. At present, the typical database management system problems have emerged in short supply for large data set handling. In the stage of the data storage, management and analysis, the situation appears powerless [1]. Effective understanding of the hidden patterns and unknown correlations within the data are very important for big data processing [2]. Mining the characteristics of enterprise big data, exploring its application value and making information intelligent decision are the core basis for enterprise in various fields to implement intelligent decision-making in big data environment. In the 21st century, the World Economic Forum in Davos takes big data as the core issue to discuss and deeply analyze how to make full use of big data to improve social benefits. The United Nations also focuses on how developing countries deal with the challenges of big data and recommends the use of big data technology to promote the development of the global economy progress [3]. The application of big data technology includes various issues such as customer relationship management, market management and fault diagnosis [4], and has a significant use value for the development of country, society and enterprises. In the development of the Internet, the emergence of big data can change the enterprise information decision-making environment, and has a non-negligible value for the development of enterprise [5]. And because of the rapid development of science technology, every corner of people’s life has a very close relationship with high technology. With the advent of the big data era, the use of big data technology has deepen every corner of people’s life [6]. The convenience brought by big data is very significant for many companies. Most companies classify the use of big data in the
same level as the strategic orientation of the company. The enterprises need to use big data technology to retrieve, query, pre-process, filter and other operation modes of complex enterprise big data to promote the development progress of enterprise [7].

As the saying goes “pros and cons depend on each other”, the advent of the big data era has established a good foundation for the development of enterprise, the application of big data technology in the enterprise information decision-making can realize intelligent, efficient and scientific information decision-making. However, the use of new technology requires a comprehensive reform of enterprise. At present, the application of big data in enterprise information decision-making management of China is not enough, and the application level of big data technology is relatively high, so it is not clear that whether the enterprise can have sufficient human and financial resources to realize the enterprise management reform [8]. Therefore, under the background of big data, enterprise information management decision-making problem is a problem full of challenges and temptations. In 2012, the research of Tu Zipei’s pointed out that the era of data has had a positive effect on the management methods and content of the government and social enterprise. In the era of big data, governments and social enterprises need to formulate development strategies that keep pace with the times, and business management must also follow the trend. In 2011, Martin Klubek believed that the potential value of data has a significant guiding role in management decision-making under the condition of continuous increase of extensive data. In 2011, Science published research on the relationship between big data and decision-making issues, which indicates that the stream of data for information decision-making has brought greater challenges.

The big data of enterprise has the characteristics of massiveness, diversity and high speed:

1) The enterprise big data has massive attributes. Generally speaking, the smallest unit of the storage enterprise big data is TB level, and the largest unit is up to PB level [9]. Big data storage capacity of enterprise of this magnitude is more common in the modern business and scientific fields;

2) Based on the data information of modern enterprise management, the data content applied and derived from the production and life of enterprise has diverse form, the diverse characteristics of enterprise big data are mainly divided into structured and unstructured enterprise big data. Among them, the structured enterprise big data is derived in the process of enterprise’s normal operation and can be processed according to the specified mode to complete data storage and recording [10], but there are differences between unstructured and structured enterprise big data. The data is network data derived when an enterprise uses the Internet, or related data derived using a certain management technology, or data generated by the interaction of people and people, people and machines, or machines and machines;

3) In the application of enterprise big data, high-speed is a significant core feature, which plays a central role in the enterprise big data generation and management.

With the rapid development of the global economy, business decision-making plays a more and more important role in the social economic life. For the development of an enterprise, management decision-making is the key, reliable decision-making is essential to improve the efficiency of business activities. With the advent of artificial intelligence technology [10] and big data era, the decision-maker’s decision-making status changes from subjective to objective, the decision-making result is scientific, not subjective. With intelligent, efficient and scientific information, reliable decision-making becomes possible.

By improving the KGmedoids algorithm, a more refined processing method is obtained, and the density weight Canopy in the process of enterprise information data processing is optimized. Use enterprise data set elements to increase the density of enterprise data samples to expand the elements near the enterprise data target and improve data search capabilities. After further screening of enterprise information data, complete and unitary data are retained. Through in-depth discussion of the application of big data in enterprise information intelligent decision-making, the KGmedoids algorithm is improved and optimized, and an enterprise information intelligent decision-making model based on the big data model is designed. The enterprise information intelligent decision-making model in this paper can comprehensively analyze the application of big data in enterprise information intelligent decision-making management, and provide a reference for enterprise information intelligent decision-making management.

In the following parts of this paper, Section II provides the application of big data in enterprise information intelligent decision-making; Section III takes the internal disclosure information of a real company as an example, then analyses the feedback, statistical response and the use effect; Section IV discusses the platform system and the necessity of the decision-making management; Section V concludes the whole paper.

II. THE APPLICATION OF BIG DATA IN ENTERPRISE INFORMATION INTELLIGENT DECISION-MAKING

A. THE CURRENT PROBLEMS OF ENTERPRISE INFORMATION DECISION-MAKING MANAGEMENT

1) SIGNIFICANT ENVIRONMENTAL COMPLEXITY

In the era of big data, on the one hand, big data technology can provide valuable application tools for enterprise information decision-making management, expand the development space of enterprise, and provide a large number of decision-making information sources for enterprise information decision-making. On the other hand, the speed of enterprise information decision-making has gradually increased. There are a lot of data and information related to enterprises, especially the data that emerges constantly from emergencies.
From an objective angle, it can be seen that the enterprise must reasonably use big data technology to quickly complete fusion processing of enterprise decision-making data, and establish a enterprise information decision-making architecture with significant interactivity, and comprehensively mine, collect, and analyze enterprise data assets with big data characteristics. Therefore, in this environment, the diverse and complex environmental factors have a certain impact on enterprise information decision, the difficulty of enterprise information decision-making increases when personnel handles enterprise information decision-making.

2) SIGNIFICANT DIFFICULTY IN JUDGING THE VALUE OF INFORMATION RELATED TO ENTERPRISE INFORMATION DECISION-MAKING

In the big data environment, the growth rate of data on the Internet is very significant. The annual growth level of human data volume has reached PB level. The growth rate of the potential information of data is faster than that of the data processing ability of the general enterprise information decision maker. The emergence of enterprise management big data has not only leads to a significant increase in the workload of enterprise informatization decision-making, because the past data management of this type of data and the current analysis methods for the effect of hidden information mining are also very poor, but also leads to the misjudgment of information decision-makers in judging the value of information related to enterprise information decision-making [11]. How to distinguish, filter and use the data with significant information value is the ability that present enterprise information decision makers need to possess. At this time, only the rational use of big data technology can set up significantly scientific decision-making scheme for enterprise information decision-making work.

3) INCONSISTENCY BETWEEN ENTERPRISE INFORMATION DECISION-MAKING PROCEDURES AND MARKET CHANGES

In the procedures of past enterprise information decision-making, the procedures such as material collection, investigation and analysis, decision plan setting all spend a lot of time. Due to the complex decision-making process of enterprise informatization, the real-time nature of decision-making gradually deteriorates, and the time lag of enterprise decision-making will cause the decision result to be inconsistent with the status quo of the enterprise and affect the speed of enterprise development.

In the big data environment, the enterprise must establish scientific and time-advanced information decision plans, and the decision-making procedures must not be too complicated, and the decision-making efficiency must be efficient, and be able to occupy the market before other companies to improve their competitiveness [12]. Using the advantages of data mining and classification processing technology in big data to obtain the data foundation is helpful for enterprise information decision-making, which can prompt enterprises to make information decision quickly and establish reasonable decision-making plans.

4) THE BACKWARD OF THE ENTERPRISE INFORMATION DECISION-MAKING METHOD

In the big data environment, the setting of enterprise information decision plan needs to revolve around the decision-making data. There are differences between big data research and other research, big data research needs to implement statistical processing for big data of enterprise with massive characteristics and analyze the relationship between the data and mine the potential information value [13]. The correlation of data for enterprise information decision-making is of significant importance, so it is necessary to follow the development law of market and establish decision-making methods that keep pace with the times. However, the current enterprise information decision-making methods lacks in-depth analysis of enterprise big data and cannot meet the demand of current enterprise information decision-making.

5) THE UNREASONABLE USE OF BIG DATA TECHNOLOGY ENTERPRISE INFORMATION MANAGEMENT DECISION-MAKING ISSUES

In the big data environment, the speed of information reform and upgrading is significant. At that time, many corporate managers still needed to in-depth analysis of corporate big data. There is not enough time for enterprise big data, and many enterprise informatization decision-making problems do not fully and rationally use enterprise big data information for management. Although they understand the great value of corporate big data to corporate development, they do not use data rationally to improve the company’s economic benefits [14]. Some state-owned enterprise will focus on using their own experience to solve the problem of enterprise informatization management and decision-making, and ignore the application of big data technology. As a result, the problem of enterprise informatization decision-making has not been properly managed by big data technology.

B. THE NECESSITY OF BIG DATA APPLICATION IN ENTERPRISE INFORMATION INTELLIGENT DECISION-MAKING

1) RATIONAL APPLICATION OF BIG DATA TECHNOLOGY IS ONE OF THE CORE CONDITIONS TO ENHANCE THE COMPETITIVENESS OF ENTERPRISES

In the big data environment, the enterprise needs to improve their own information intelligent decision-making capabilities. In the era of big data, the amount of information derived from network, high-tech and other transmission presents “explosive” feature. If an enterprise wants to reasonably mine the required data in the massive data stream and help the enterprise’s information intelligent decision-making, it needs to optimize the existing decision management. How to use innovative methods to obtain valuable data and provide help
for enterprise information decision-making, which is a problem that needs all enterprises to pay attention to.

2) THE REASONABLE APPLICATION OF BIG DATA TECHNOLOGY IS A BRIDGE OF COOPERATION BETWEEN ENTERPRISES

The core goal of enterprise management is profit. Therefore, the competitiveness of enterprise is an issue that cannot be ignored between enterprises. According to the current status of competition between enterprises, modern enterprises need to consider the relationship between enterprises in the process of decision-making and management. In the data environment, a lot of decision-making information between enterprises has demonstrated the sharing, so the decision-making method of enterprise decision-making managers is very important. Companies will cooperate with similar competitiveness, so if companies want to improve their competitiveness, they need to fully optimize their competitiveness in the big data environment in order to cooperate with better companies. Therefore, the reasonable application of big data technology is a bridge of cooperation between enterprises.

C. THE SPECIFIC APPLICATION OF BIG DATA IN ENTERPRISE INFORMATION INTELLIGENT DECISION

1) MECHANISM OF BIG DATA OPTIMIZING ENTERPRISE INFORMATION INTELLIGENT DECISION

Big data can change the organizational structure of enterprise information decision management and optimize the main thinking of enterprise information decision-making, which belongs to the core of enterprise information decision-making scientific and intelligent support technology. How to use big data technology to optimize the effect of enterprise informatization decision-making is a key issue.

From the perspective of characteristics, the characteristics of big data have practical value for the matching of enterprise managers and positions. Only when enterprise information decision-makers fully grasp the characteristics of big data and apply them rationally, they can give full play to enterprise data and their own value, and have a positive impact on their career development to improve enterprise decision-making management.

From the perspective of process analysis, in the enterprise big data environment, enterprises can optimize the effect of corporate information decision-making by constructing a closed-loop decision-making process around data. This closed-loop decision-making process is: data-quantitative analysis-decision-making [15]. This paper tends to focus on the use of this closed-loop decision-making strategy. The help of big data to the effect of enterprise information decision-making has a significant process orientation. Under the condition of sufficient experience, an enterprise information decision-making model is established by method of enterprise big data processing and other relevant methods, and then a scientific decision-making strategy is established. The schematic diagram of mechanism of big data optimizing enterprise information intelligent decision is shown in Fig. 1.

As shown in Fig. 1, big data technology can optimize the interpretation level of enterprise information decision-making problems and realize the democracy of enterprise information decision making. The establishment of enterprise information decision-making problem belongs to a process of observation and calculation of enterprise information intelligent decision making, which requires a comprehensive analysis of the difference between the enterprise goal and the actual situation before making decisions. In the perception period of enterprise information decision making problems, big data technology can reduce the complexity of enterprise information decision making problems, optimize the cognition of enterprise decision making managers on enterprise information decision-making problems, actively grasp the trend of data changes according to the dynamic changes of enterprise big data, and grasp the relationship between the enterprise information data and decision-making in real time.

In the search period of decision-making problems, big data technology can expand the retrieval interval, optimize the retrieval instructions, timely explore the correlation between enterprise big data, mine the potential data value of enterprise big data, and provide valuable information for enterprise information decision makers.

In the period of decision-making problem definition, the previous decision-making method mainly takes senior leaders of enterprises as the main body of decision-making, and the definition of decision-making results in this form is not scientific [16]. The use of big data technology can comprehensively collect enterprise internal and external data information, set scientific definition criteria, provide
comprehensive list of information data for enterprise information decision makers, and help enterprise decision makers to accurately define problems.

During the presentation period of enterprise information decision-making problems, the development trend of enterprise problems can be accurately predicted according to the existing information. In short, big data can go deep into all stages of enterprise information decision-making, reduce the difficulty of enterprise information decision-making, and improve the scientific and democratic decision-making of enterprise information.

2) THE ESTABLISHMENT OF THE OPERATION MODE OF ENTERPRISE INFORMATION INTELLIGENT DECISION MODEL BASED ON BIG DATA TECHNOLOGY
In the big data environment, various enterprise big data needs to be comprehensively and fully mined and applied, and a large amount of causal data and empirical data are used to realize intelligent analysis through intelligent algorithms. Enterprise use big data technology to realize intelligent analysis and decision-making of enterprise information, they can optimize enterprise information decision-making ability, make enterprise information decision-making management towards intelligent, digital development. And the decision-making identity of decision-makers also changes from subjective to objective. The intelligent and procedural decision-making can directly use closed-loop mode to realize intelligent decision-making management of enterprise information [14]. Therefore, the operation mode of enterprise information intelligent decision model based on big data technology is designed as shown in Fig. 2.

![FIGURE 2. Operation mode of enterprise information intelligent decision based on big data technology.](image)

As shown in Fig. 2, the core of operation mode of enterprise information intelligent decision based on big data technology is the mining and processing of enterprise big data. Enterprise information decision-making is not separable from the use of big data technology. Big data runs through the entire process of enterprise information management. In enterprise information intelligent decision-making, the extraction of enterprise big data mainly comes from the production organization, system process, and management command process of the enterprise. Through the processing of big data technology, intelligent decision-making technology can be used to realize enterprise information intelligent decision-making.

3) ENTERPRISE INFORMATION DECISION MODEL BASED ON BIG TECHNOLOGY
Combined with mentioned above the mechanism of big data optimizing enterprise information intelligent decision and the operation mode of enterprise information intelligent decision based on big data technology, the enterprise information decision model based on big technology is constructed.

Enterprise information intelligent decision model based on big data technology is shown in Fig. 3. Enterprise information intelligent decision model based on big data technology can use big data mining technology to effectively mine and obtain relevant data according to the needs of the enterprise, and help the enterprise decision-making makers in the form of human-computer interaction to realize information intelligent decision-making through intelligent algorithms. Due to the unexplained nature of Deep Learning, no one knows exactly what DL has learned, which aggravates the insecurity and unreliability of the Deep Learning tasks [18]. So this paper adopts intelligent algorithm. The advantage of the enterprise information intelligent decision-making model based on big data technology is that its decision-making subject is a scientific and intelligent algorithm, and the decision-making results are scientific and not subjective. In the process of enterprise information decision-making management, a large amount of structured, semi-structured, and unstructured information data can be used to research and judge enterprise information data and obtain value information [19]. Enterprises can use structured data to set multiple types of reports as information units through inherent key-value methods, so as to obtain all the corresponding data of the company’s internal reports, and the data has a fixed format. Semi-structured data can obtain corresponding information through flexible key value adjustment, and the format of the data is not fixed. The information stored under the same key value may be numeric, text, or dictionary or list, with a high degree of flexibility. Unstructured data can be used to represent data that is irregular or incomplete in data structure, and it is not convenient to use the two-dimensional logical table of the database to represent data. Corresponding information cannot be obtained through key values, which extends the intelligent decision-making of enterprise information.
4) ENTERPRISE INFORMATION DECISION MODEL BASED ON BIG TECHNOLOGY

(1) The mining, selection, sorting, filtering, transformation and utilization of big data

a: MINING AND SELECTING
According to the set enterprise big data collection conditions, determine the attributes of the data to be collected, set the collection standards according to such attributes, and then use a certain format and compression ratio to store the collected data [20]. Through a simple random sampling method, a large amount of data information within the enterprise is sampled, and a single information sample is selected as an element, so that every information data in the entire enterprise has the same probability of being selected.

b: SORTING
The improved KGmedoids algorithm can effectively store enterprise big data information with different sources. Density weight optimization and improvement of Canopy can quickly collect large-scale, diverse, and high-speed corporate information big data, and process them in batches according to different information content. This kind of information processing method can form a clustering and sorting mode of enterprise big data types, which can save data extraction efficiency in the process of enterprise information decision-making.

The enterprise big data set is defined as \( E = \{e_1, e_2, \cdots, e_m\} \), there are \( m \) data collection in this data set, in the presence of \( k \)-dimensional attributes of each target sample, then the dimension attributes of the \( j \) data target is \( c_{jk} \).

The Euclidean distance between the target enterprise big data \( c_j, c_i \) is shown as:

\[
    w_{ji} = \sqrt{\sum_{k=1}^{z} (c_{jk} - c_{ik})^2}. \quad (1)
\]

The mean distance of the sample target in enterprise big data set \( E \) is shown as:

\[
    E_{AverDis}(E) = \frac{2}{m(m-1)} \sum_{j=1}^{m} \sum_{i=j+1}^{m} w_{ji}. \quad (2)
\]

The density value of sample target \( e_m \) in enterprise big data set \( E \) is defined as \( \theta_j \), \( \theta_j \) is the amount of sample data is consistent with the distance between certain data and the sample data target \( e_m \) is not greater than \( AverDis(E) \).

\[
    \gamma_j = 2 \frac{\theta_j \theta_j - 1}{\theta_j \theta_j - 1} \sum_{j=1}^{m} \sum_{i=j+1}^{m} w_{ji}. \quad (3)
\]

The distance between the target data sample \( e_j (e_j \in e_m) \) in enterprise big data set \( E \) and the other data \( e_j \) is defined as \( r_j \), if the density value of \( e_j \) is the highest value, then \( r_j = \max(w_{ji}) \).

Divide the enterprise big data set \( E \) into \( h \) clusters, the center of the cluster \( D_i \) is \( d_i \), then the clustering effect of the data can be judged by the clustering cost \( F \):

\[
    F = \sum_{i=1}^{h} \sum_{u \in D_i} w_{ud}. \quad (4)
\]

Among them, the data element in \( D_i \) is \( u \); the Euclidean distance is \( w \); the value \( F \) is relatively small, represents the smaller the interval within the cluster, the better the clustering effect.

The density weight of the cluster centers is shown as:

\[
    \rho_j = \theta_j \frac{1}{\gamma_j} \times r_j. \quad (5)
\]

To sum up, the clustering process of the improved KGmedoids algorithm based on density weighted canopy is as follows:

Step 1: Set the enterprise data set \( E \), calculate the density of all sample data, the maximum density of the sample is set to select the first cluster center, the center point of the cluster centers introduced in set \( D_i \).

Step 2: Calculate the density value of the elements in the enterprise data set, the mean distance, and the distance between the data target, the second clustering center is set by using Equation (5). The greater the weight of the enterprise
data density, the more elements around the enterprise data target $e_j$, and the better the concentration. Here is the second cluster centers;

**Step 3:** The step 2 is performed several times, and it can be stopped until the enterprise big data set $E$ is empty.

c: FILTERING

There are not only incomplete data information in enterprise big data, but also repetitive data. Therefore, enterprise big data must be filtered to leave complete and non-repetitive data.

d: TRANSFORMATION

Data transformation can be understood as the normalization operation of enterprise big data, the original enterprise big data is transformed into data with a conventional format. In this paper, the data normalization method used in enterprise information intelligent decision-making is as follows:

In the setting enterprise information intelligent decision-making, there are $Q$ types of samples in the enterprise big data set, each sample has $I$ characteristics, the i-th characteristic of the q-th sample, and the i-th characteristic of the q-th sample after normalization are $y_{i}^{(q)}$, $\tilde{y}_{i}^{(q)}$, respectively. The normalization process is mainly divided into linear normalization, energy normalization, destabilization energy normalization, and similar feature normalization.

The specific operation method of linear normalization is as follows:

$$\tilde{y}_{i}^{(q)} = b_{i}y_{i}^{(q)} + c_{i}.$$  

Among them, $b_{i}$, $c_{i}$ are feature vectors of enterprise big data. The minimum and maximum values of all $Q$ features is set to $y_{imin}$ and $y_{imax}$, respectively. The i-th eigenvector of all samples $D$ normalized to $y_{i}^{(q)} \in [\tilde{y}_{i}^{(q)} \cdot \bar{y}_{imax}]$, that is:

$$\bar{y}_{i}^{(q)} = b_{i}y_{i}^{(q)} + c_{i} = \frac{(\bar{y}_{imax} - \bar{y}_{imin})y_{i}^{(q)}}{(y_{imax} - y_{imin})} + \left(\bar{y}_{imax} - \frac{(y_{imax} - y_{imin})y_{i}^{(q)}}{(y_{imax} - y_{imin})}\right).$$  

The specific operation method of energy normalization is shown as:

$$\tilde{y}_{i}^{(q)} = \frac{y_{i}^{(q)}}{\|y_{i}\|_{d}}.$$  

Among them, $\|y_{i}\|_{d}$ is the vector norm established by the i-th feature of all samples in enterprise big data set.

Destabilizing energy normalization is to filter out the steady state component of all samples without different eigenvalues in enterprise big data set, the operation method is as follows:

$$\tilde{y}_{i}^{(q)} = \frac{y_{i}^{(q)} - \bar{y}_{i}}{\|y_{i}\|_{d}}.$$  

Among them, the mean of the i-th feature component of all samples $D$ is $\bar{y}_{i}$.

$$\bar{y}_{i} = \frac{1}{Q} \sum_{q=1}^{Q} y_{i}^{(q)}. $$  

Similarity feature normalization is to normalize the data with repeated features. The big data set of the enterprise is set to $G$ types, and there are $\bar{y}_{j}$ mode samples for each type $\hat{y}_{j}$, then the subset established by the class $\hat{y}_{j}$ data is as follows:

$$\tilde{y}_{ij} = \left\{y_{ij}^{(q)} \right\}.$$  

The statistical mean of the i-th feature of the class $\hat{y}_{j}$ is as follows:

$$\bar{y}_{ij} = \frac{1}{M^{(j)}Q} \sum_{q=1}^{Q} y_{ij}^{(q)}.$$  

The energy normalization method within the category is as follows:

$$\tilde{y}_{ij}^{(q)} = \frac{y_{ij}^{(q)} \cdot \hat{y}_{j}}{\|y_{ij}\|_{m}}.$$  

Among them, $\|y_{ij}\|_{m}$ is the vector norm established by the i-th feature after all samples are destabilized in $\hat{y}_{j}$ types; $y_{ij}^{(q)}$ is the data sample after removing the steady-state component.

(2) The interactive genetic algorithm-IGA algorithm

Genetic algorithm is used to search the parameter space of the problem for the optimal solution of enterprise information decision-making program, the adaptive value of the search must be non-unknown, the IGA algorithm can independently operate under this condition. However, there are subjective factors in the intelligent decision management problem of enterprise information, and it is difficult to construct the corresponding objective function, the traditional genetic algorithm cannot be used to obtain the optimal solution. Therefore, if the enterprise information decision-making program can be evaluated by relevant experts in a reasonable mode, the IGA algorithm is very suitable [21].

The basic principle of interactive genetic algorithm is consistent with genetic algorithm. The difference is that the fitness function does not require manual data collection and selection. The use of arithmetic algorithms to optimize population individuals can effectively avoid the subjective factors of enterprise information intelligent decision-making management influences. The specific application steps are shown in Fig. 4.

**Step 2:** Initialization

When preprocessing enterprise big data, set the optimal population size, the maximum value of genetic algebra, the variation and crossover probability of enterprise information decision-making procedures.

**Step 2:** Initial population The initial population of chromosomes is obtained by random methods. The initial population is the original value of the enterprise information decision
Step 3: Stop condition
If genetic algebra is the largest, it can end, otherwise, go to the fourth step.

Step 4: Selection
Use reasonable selection method to select individuals to join the new population.

Step 5: Crossover
The setting crossover operator is used to achieve crossover processing of population individuals:

$$q_c(t) = \left( 1 + e^{-h_1 \cdot (\alpha(y_i(t)) + \beta(x_i(t)))} \right)^{-1}.$$  \tag{14}

Among them, $e$ represents natural constant; $h_1$ represents adjustment coefficient; $\alpha(y_i(t))$ represents the convergence rate of population individual fitness; $\beta(x_i(t))$ represents the uncertainty of population individual fitness; $t$ represents iterative times. In the numerical analysis of enterprise information, the convergence rate has the optimal algorithm, which can be used to evaluate the performance of the information data iteration method in the enterprise intelligent decision-making problem. As an important algorithm, the method is:

$$\alpha(y_i(t)) = \sum_{M=1}^{M} \frac{|g(y_i(t)) - g(y_{i+1}(t))|}{\max_{y_i(t)} g(y_i(t)) - \min_{y_i(t)} g(y_i(t))}.$$  \tag{15}

Step 6: Mutation
The mutation operator in the genetic algorithm is an indispensable individual auxiliary condition for the numerical analysis of enterprise information. It effectively strengthens the data transformation ability of the mutation operator, improves the algorithm’s search drawbacks, and overcomes the shortcomings of premature convergence. The setting crossover operator is used to achieve mutation processing of population individuals:

$$p_m(t) = 1 - \left( 1 + e^{-\frac{k_2}{t_2 \cdot \rho_{xy}(t)}} \right)^{-1}.$$  \tag{16}

Among them, $k_2$ represents adjustment coefficient.

Step 7: The calculation of fitness value
The user evaluates the fitness value of population individuals (each decision plan) to determine whether the number of iterations is the maximum number. If it is satisfied, the enterprise information decision program at this time will be output, otherwise it will go back to step 3.

III. RESULTS AND ANALYSIS

A. THE QUANTITATIVE ANALYSIS OF THE APPLICATION VALUE OF BIG DATA TECHNOLOGY TO ENTERPRISE INFORMATION DECISION MANAGEMENT

In order to quantitatively analyze the application value of big data technology to enterprise information decision management, use data to verify the importance of big data technology to enterprise information decision management. This paper will take the internal disclosure information data of a machinery group company as a test sample, SPSS 20.0 software as a statistical processing tool, and use the t test and $x^2$ test methods to determine the use of big data technology in enterprise information intelligent decision-making.

1) THE FEEDBACK RESULTS OF THE USE OF BIG DATA TECHNOLOGY FOR MANAGERS IN ENTERPRISE INFORMATION INTELLIGENT DECISION-MAKING

The feedback results of the use of big data technology for managers in enterprise information intelligent decision-making are shown in Table 1.

| Identity          | Before using | After using | t     | P     |
|-------------------|--------------|-------------|-------|-------|
| Department leaders| 80.30±7.65   | 92.38±8.95  | 7.958 | 0.030 |
| Head of Department| 81.98±8.12   | 93.70±9.03  | 7.485 | 0.027 |
| Junior manager    | 81.70±8.35   | 91.84±8.87  | 6.456 | 0.046 |
| CEO               | 81.10±7.95   | 93.35±8.25  | 8.293 | 0.038 |

The feedback results of the use of big data technology for managers in enterprise information intelligent...
decision-making show that the score of enterprise information decision making management using big data technology is greater than before, which is statistically significant.

2) THE FEEDBACK RESULTS OF THE USE OF BIG DATA TECHNOLOGY FOR FRONT-LINE ENTERPRISE STAFF IN ENTERPRISE INFORMATION INTELLIGENT DECISION-MAKING

The feedback results of the use of big data technology for front-line enterprise staff in enterprise information intelligent decision-making is shown in Table 2.

### TABLE 2. Feedback results.

| Identity         | Before using | After using | t        | P       |
|------------------|--------------|-------------|----------|---------|
| Before using     | 82.64±10.29  | 94.44±10.89 | 6.107    | 0.032   |
| After using      | 81.98±9.26   | 93.98±10.40 | 6.683    | 0.048   |

The feedback results of the use of big data technology for front-line enterprise staff in enterprise information intelligent decision-making show that after using big data technology, the score of enterprise informatization decision-making management is higher than before, which has statistical significance.

3) THE FEEDBACK RESULTS OF QUESTIONNAIRES BEFORE AND AFTER USING THE BIG DATA TECHNOLOGY

The enterprise staff randomly distributed 50 questionnaires to analyze the feedback results of questionnaires before and after using the big data technology, as shown in Table 3.

### TABLE 3. Feedback results of questionnaires before and after using big data technology.

| Decision content | Before using | After using | t       | P       |
|------------------|--------------|-------------|---------|---------|
| equipment        | 82.40±8.95   | 96.95±10.84 | 8.025   | 0.041   |
| distributor      | 80.13±8.77   | 94.64±10.58 | 8.188   | 0.034   |
| Finance          | 82.62±9.04   | 93.38±10.26 | 6.102   | 0.042   |
| personnel        | 83.66±9.27   | 95.04±10.63 | 6.257   | 0.036   |

The feedback results of questionnaires before and after using the big data technology shows that the score of equipment, distributor category, financial class and personnel class after using big data technology are higher than before, with statistical significance.

4) THE STATISTICAL RESULTS OF ENTERPRISE SCORING CHANGES BEFORE AND AFTER USING THE BIG DATA TECHNOLOGY

The enterprise staff randomly distributed 50 questionnaires, the statistical results of enterprise scoring changes before and after using the big data technology are shown in Table 4.

### TABLE 4. Statistical results.

| Level         | Before using | After using | x²     | P       |
|---------------|--------------|-------------|--------|---------|
| Excellent     | 21           | 21          |        |         |
| Good          | 17           | 28          | 6.989  | 0.043   |
| Difference    | 12           | 1           |        |         |
| Excellent and good rate /% | 0.76 | 0.98 |

From the analysis of Fig. 5 and Fig. 6, in the intelligent decision-making of enterprise information, the matching degree between the optimal decision-making scheme of enterprise information obtained by the interactive genetic algorithm-IGA algorithm and the practical problem of enterprise is relatively high, which is more than 95%. The number of iterations to obtain the optimal decision scheme is 6, and the number of iterations is small. It can be seen that the

B. THE USE EFFECT OF THE TEST OF THE INTERACTIVE GENETIC ALGORITHM - IGA ALGORITHM

From the angle of quantification, the scheme optimality of information decision and information decision-making efficiency are tested by using IGA algorithm in enterprise information intelligent decision making, the scheme optimality of information decision is mainly through the matching degree between the enterprise information decision-making scheme and the actual problems of the enterprise. The higher the matching degree, the better the use effect of the algorithm. The information decision efficiency is mainly reflected by the iteration times of the interactive genetic algorithm-IGA algorithm in obtaining the optimal decision-making scheme. The optimality test results of the interactive genetic algorithm-IGA algorithm scheme and the test results of information decision efficiency are shown in Fig. 5 and Fig. 6.
The interactive genetic algorithm-IGA algorithm has significant value in enterprise information intelligent decision making.

IV. DISCUSSION

Based on the research content of this article, the following suggestions are put forward on how to improve the effect of enterprise informatization decision-making in the era of big data:

A. THE ESTABLISHMENT OF BIG DATA PLATFORM MANAGEMENT SYSTEM

In the process of enterprise development, the emergence of big data brings massive and diversified enterprise big data. Companies can use big data analysis methods to comprehensively analyze their own business operations, fully understand the specific conditions of competing companies, and deeply analyze customer needs and market development laws, and then make enterprise information intelligent decision-making. Big data technology must be used correctly to serve the enterprise information decision-making management. It is necessary to accelerate the construction of the big data platform management system to realize the transformation from plan to reality. The big data platform management system is used to fully integrate the flow of internal data and information in the enterprise, and set up scientific and intelligent decision-making programs for the enterprise.

B. THE ESTABLISHMENT OF THE ENTERPRISE BIG DATA TECHNICAL TEAM FOR ENTERPRISE AS SOON AS POSSIBLE

In the big data environment, enterprise big data is almost unprocessed original ecological data, the extraction and interpretation of such data requires specialized technical personnel. Therefore, from the enterprise point of view, it is necessary to establish the enterprise big data technical team as soon as possible. The purpose of the establishment is to help enterprise information intelligent decision makers to realize the enterprise information intelligent decision-making through the full interpretation of relevant data by the technical personnel. Enterprises must actively employ technical talents in the field of big data, and quickly establish enterprise big data technology team, so that technicians can accurately extract the information and knowledge required by the enterprise, and extract the valuable information from big data. Under this operation, the value of big data can be used to improve the effect of enterprise information intelligent decision-making and enhance the market competitiveness of the enterprise.

V. CONCLUSION

This paper deeply analyzes the use value of big data technology in enterprise information intelligent decision-making work and mainly draws the following conclusions:

1) Enterprise big data has three core features: massiveness, diversity, high-speed.

2) The current problems of enterprise informatization decision-making management include: the significant environmental complexity, the significant difficulty in determining the value of information related to enterprise informatization decision-making, the incompatibility of enterprise informatization decision-making procedures with market changes, the diversification of enterprise informatization decision-making bodies, the backward enterprise informatization decision-making methods, the lack of big data that enterprises attach great importance to, and the unreasonable application of big data technology, and the lack of data analysis talents.

3) Analyzing the necessity of big data technology in enterprise information intelligent decision-making, it can be seen that the rational application of big data technology is one of the core conditions to enhance the competitiveness of the enterprise, and is the bridge of cooperation between enterprises.

4) The quantitative analysis of the application value of big data technology to enterprise information decision-making management shows that: Taking a private enterprise as an example, fifty questionnaire surveys on the role of big data technology in enterprise informatization decision-making obtained from managers and front-line employees show that there are significant differences in the effect of informatization decision-making before and after using big data technology.

5) In the intelligent decision-making of enterprise information, the matching degree between the optimal decision-making scheme of enterprise information obtained by the interactive genetic algorithm-IGA algorithm and the practical problem of enterprise is relatively high, which is more than 95%. The number of iterations to obtain the optimal decision scheme is 6, the fewer the number of iterations, the better the use effect.
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