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Research Article

Prediction Algorithm of Labor Employment Capacity and Structure Based on Improved Genetic Algorithm

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As a general economic resource or capital, labor plays a vital role in the development of a country. The improvement of people's living standards is the fundamental purpose of economic development. The economic development of a country is impossible from the support of the labor force. The supply and support of the labor force will directly affect the normal operation of a country's economy. Since the reforms are opening up, China has made remarkable achievements in rapid economic development, but some new problems have gradually emerged in the labor market. On the one hand, important changes have taken place in the supply and demand situation of the labor market. The labor shortage crisis has started to spread across the country. With the increase of labor costs of enterprises and the adjustment of industrial structure, the problems of employment in the labor market such as large-scale layoffs and reduction of labor have become more prominent. On the other hand, the population's age structure is gradually changing. China is about to enter an aging society in the future. This means that the proportion of old people towards youngsters will increase. At that time, China's huge population size will likely evolve from a booster of economic growth to a burden on the economy. Therefore, the labor structure needs to be optimized urgently. Deepening the reforms requires China to transform its growth model and develop knowledge-intensive industries. It requires optimizing the capacity and structure of the labor market and improving the quality of the labor force. Measuring the total workforce in the future is an important prerequisite for addressing various challenges in the new situation. A genetic algorithm is a computational model of the biological evolution process that simulates the natural selection and genetic mechanism of Darwin's theory of biological evolution. This is a technique of modeling the natural evolution process to get the best solution. In data mining, genetic algorithm has been widely used around the world. It is an important development direction to use them to effectively mine and predict data. Based on the changes in the age structure of the population, this paper will use an improved genetic algorithm. This algorithm will calculate the total labor supply and structural changes in China in the next few years. This study will provide a reference for the formulation of China's macroeconomic and population policies.

1. Introduction

The amount of labor supply in a country is a part of the total population, and the prediction of labor supply can be understood as a branch of population prediction. As a result, numerous academics in the United States and overseas have employed statistics, mathematics, demography, and other methodologies to forecast the population of various nations and areas. In general, population forecasting methods can be divided into the following two categories.

The first category is based on the laws of population development. The population exponential growth model proposed by [1] can be regarded as the earliest population prediction model. The population prediction is based on an exponential growth function, and the model assumes that the population's relative growth rate is constant. He used hundreds of years of demographic data to make predictions about the future population. Later, the Dutch mathematician and biologist Verhulst revised the Markov model in 1838 and proposed a logistic population prediction model, which took into account the constraints of the environment. In 1945, Lewis and Leslie established the Lelie matrix based on the Kiefitz matrix and introduced the matrix into the population forecasting method [2, 3]. The famous British economist Stone, who won the Nobel Prize in Economics, proposed the population input-output model in 1970. He applied the analysis method of input-output technology to the modeling analysis of the population system. In recent years, many scholars in China have made predictions on the population of different age groups in the country through the method of population age shift based on the Stone model. Meng Lingguo used the data of the sixth population census as the base period data, also set three different fertility rate plans according to China's family planning policy, and predicted the total population and age of China from 2015 to 2050. The findings show that if a looser family planning program is implemented than the two-child policy, China's aging population's structural characteristics will be considerably relieved [4–6]. The second category is methods based on mathematical theory. Based on the ARMA model, Ren Qiang made a forecast of China's total population every five years from 2010 to 2050. The forecast results show that China's total population will reach a historical maximum of 1.435 billion in 2020 and then begin to decline [7–10]. Jiang Hui used the gray model to predict the population of China from 2015 to 2030. The prediction results show that the total population of China will reach 1.348 billion, 1.36 billion, 1.348 billion, and 1.373 billion in 2015, 2020, 2025, and 2030, respectively. Yi Liang used the grey model to predict the country's future population changes, showing that the country's total population will reach 1.423 billion and 1.483 billion in 2015 and 2020, respectively. Based on the 2000 census data, Dong Huanyu predicted China's population with 5-year-olds as a group. The conclusion shows that the country's working-age population will reach its peak in 2025 and then show a downward trend year by year [11–13].

However, the factors affecting the balance of labor supply and demand include both total supply and demand and structural supply and demand, both of which are indispensable. At present, China's labor force structure has undergone great changes, and our research and analysis have confirmed that these changes have had a huge impact on economic growth. In the past, the contribution of the labor force participation rate to the economy has seriously affected the economic growth which resulted in the decline of the labor force and has produced a pulling effect on the economy [14, 15].

However, humanity is on the verge of the Fourth Industrial Revolution, in which breakthrough technologies like artificial intelligence, robotics, data science, quantum computing, the internet of things, and others will enable advanced applications like social robots, autonomous vehicles, virtual assistants, 3D printing, and desktop manufacturing, among others [16–18]. Labor economists are debating the implications of introducing technology to boost productivity in general, and automation through robots and AI in particular, on employment. These factors will also have a huge impact on employment.

The above analysis analyzes the impact of changes in the labor force participation rate of both genders on economic growth through horizontal and vertical comparisons. Two notable differences emerge. First, there are significant gender differences in the contribution rate of labor force participation rate to the economy. Second, although the contribution rate of women's labor force participation rate to the economy has also experienced a continuous decline, it is not as obvious as that of men. Its contribution rate is significantly lower than men's after stability, indicating a significant difference [19–21]. Therefore, in view of the above two findings, it is necessary to focus on finding the internal cause of the sharp decline in the contribution rate of the male labor force participation rate to the economy according to the changing process of the labor force participation rate. The contribution rate of labor participation rate to the economy in the eastern and western regions is much more volatile. Therefore, it is of great practical significance to find measures to improve the contribution rate of the labor participation rate in the central region to the economy. It can also reduce the fluctuation of the contribution rate of the labor participation rate in the eastern and western regions to the economy [22–25].

After the introduction section, the relevant theoretical basis of the research paper is explained in Section 2. Secondly, the application of the genetic algorithm in labor capacity and structure prediction is discussed in Section 3. After that, the empirical research and data analysis of the study is discussed in Section 5. Lastly, the conclusion of the research paper is discussed in Section 6.

2. Relevant Theoretical Basis

This research paper is based on the labor employment capacity and structure using the genetic algorithm. This section of the research paper gives the relevant theoretical basis of the study by explaining the genetic algorithm and its implementation structure. Afterward, the encoding and moderate function section is discussed. After that, the select function is discussed, and lastly the crossover and mutation operations are discussed.

2.1. Genetic Algorithm. A genetic algorithm is a bionic algorithm that obtains the optimal value of the function by simulating the process of survival of the fittest. Starting from the generation of the initial population, the simulated organism continuously survives the fittest through selection operators, hybrid operators, and mutation operators. This results in the population continuing to gather near the target value. The genetic algorithm has four important problem-solving steps: encoding the problem variables and generating the first-generation population, calculating the moderate function value of the individual, designing the genetic operation (such as selection, crossover, and mutation), and judging the stopping criterion. Compared with the parent, it is a completely new individual, but it also ensures that the population converges to the optimal solution, and Figure 1 shows detailed information about the algorithm.

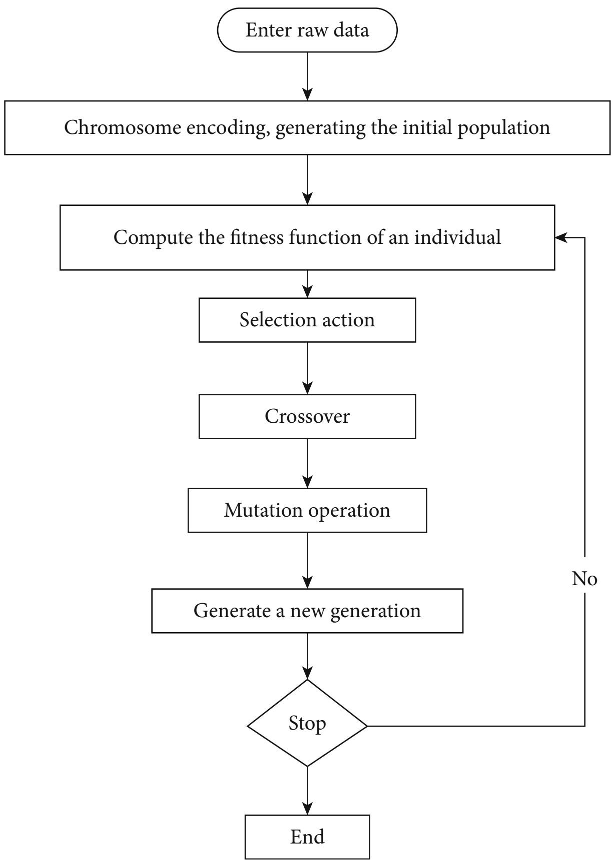

Figure 1: Operation flow chart of the genetic algorithm.

2.2. Encoding. Coding is to map the search range processed by the genetic algorithm to the feasible solution range of the problem. Conversely, the mapping process that reverses the encoding is the decoding process. Encoding and decoding are necessary processes of genetic algorithms and, in some cases, may have an important impact on the accuracy of the algorithm. Coding is a necessary step of a genetic algorithm, and the quality of coding has a great influence on the subsequent calculation accuracy. There are many ways to design genetic algorithm coding schemes for specific problems. In practical applications, there are methods such as binary encoding and floating-point encoding. The most widely used coding method in the genetic algorithm is binary coding. As the name implies, binary coding is to use 0 and 1 to form genes. The individual is composed of multiple binary representation genes. The length of the individual determines the length of the binary code, that is, the size of the encoded representation space. The most obvious indication is that it has an impact on the accuracy with which problems are solved. Using binary code to encode and decode is easier in algorithm design, and at the same time, it is more conducive to the realization of the algorithm in the design of the genetic operation algorithm. Binary coding also has its limitations. When the coding precision is required to be high, the coding space will increase exponentially. This strategy will use more of the genetic algorithm's search capacity and will place more demands on computer storage and processing power.

The binary coding approach has been shown to be successful in addressing the optimum problem with a single latitude and a specific accuracy. However, in order to improve the problem's latitude and precision, the researchers proposed a floating-point encoding method, in which the real value of the problem variable is directly used to represent each gene value with a specific range of floating-point numbers, with each encoding length equal to the number of problem variables. The genetic algorithm's coding complexity is reduced as a result.

2.3. Moderate Function. The moderate function calculates the degree of adaptation of each individual in the group to the objective function one by one. The size of the moderate value represents the degree of adaptation of the individual to the moderate function. The higher the individual fitness function value, the more likely the person is to be chosen as the following generation's mother. Conversely, individuals with small fitness values will degenerate and disappear in heredity. In the genetic algorithm, the function value of the moderate function is not required to be negative. In a practical problem, to find the maximum value of an issue, there is no guarantee that there is a non-negative function value for each variable. In order to find the solution of the genetic algorithm, the objective function needs to be converted into a moderate function. The fitness function, which is at the heart of the genetic algorithm, determines each individual's fitness. The design of the moderation function should be simple and clear. The moderation value should have an increased degree of variance. In designing the moderate function, the situation with less discrimination due to the moderate value should be avoided. This method will lead to the inability of individual differences to be clearly reflected, making the selection of genetic algorithms difficult, and cannot fully reflect the survival of the fittest. It may even cause abnormal individuals to be "premature." The function may converge in advance, and the global optimal solution cannot be obtained.

$$yt = \phi_t y_{t-1} + \phi_2 y_{t-2} + \cdots + \phi_p y_{t-p} + \mu_t - \theta_1 \mu_{t-1} - \cdots - \theta_q \mu_{t-q}. \tag{1}$$

2.4. Select Action. The selection operation selects individuals according to the moderate value of each individual. The individuals with higher moderate values will have a greater probability of being selected for inheritance in the next generation. Conversely, individuals with lower moderate values will have a greater probability of being discarded, achieving a natural survival of the fittest effect. Through continuous operations of selection, certain types of individuals will be selected and retained. The population will tend to be optimal. The selection operation should avoid losing good individuals, but it also needs to improve the global convergence speed of the problem. Improper selection of the selection operator will result in population degradation, increased population similarity, and a pause in the genetic evolution process. This may lead to the "premature" of the population, making the function converge to the local optimum. Typical selection methods include the proportional value function method, the expected value method, the ranking method, and the optimal preservation method.

The proportional method of the moderate value function determines the probability of being selected according to the moderate value of the individual. This shows a proportional relationship. When the individual median is high, that is, when the proportion of the individual median to the sum of the overall median is high. This shows that the probability of being selected is high. If an individual is selected, the probability of being selected is as follows:

$$L(\theta) = \frac{1}{2n}\sum_{i=1}^{n}(x_i\theta - y_i)^2. \tag{2}$$

In the expected value method, when the population is small, there may be a phenomenon that the random variable cannot reflect the appropriate function value. The expected value method can avoid this situation. The selected expected value is determined for each individual engaging in the operation one by one in the expected value approach. The method of arranging the times of selection is: all individuals are selected according to the integer times of the expected value. The fractional part of the expected value of each remaining individual is distributed by means of rotation method, etc. until the number of individuals reaches the number of populations.

$$\phi(B)y_i = \theta(B)u_i. \tag{3}$$

The ranking method is to perform an adaptive calculation on all individuals in the population and then sort them according to the moderate function value from large to small. The sorting probability table has been designed according to the experience, and the probabilities are numbered from the largest to the lower. The moderate value and the probability number are matched one by one, and the corresponding probability is assigned to each individual. The ranking approach has no direct relationship with the value of a single moderate function, and the level of randomness is quite high.

$$A = \begin{pmatrix} a_{11} & \cdots & a_{1n} \\ \vdots & \ddots & \vdots \\ a_{n1} & \cdots & a_{nn} \end{pmatrix}, B = (b1, b2, \cdots, bn)^T. \tag{4}$$

In the optimal preservation method, the above three methods are all methods based on probability selection, which have their advantages. For example, individuals with small moderate function values may also participate in inheritance, but they also have their disadvantages. Individuals with the highest moderate value also participate in probability selection. During the operation, it is possible to eliminate individuals with moderate function values. The optimal preservation method supplements the deficiencies of the above methods. The best preservation method will calculate a moderate function for each individual and save some of them with the best moderate value. It does not participate in the crossover and mutation operations after the genetic algorithm. It directly acts as the individual of the next-generation population to ensure that the genes of the optimal individual are nondestructive.

$$\frac{dX^{(1)}}{dt}AX^{(1)} + B. \tag{5}$$

However, in each generation of inheritance, there are optimal individuals who do not participate in the crossover and mutation process, which will lead to the increase of local optimal individuals and increase the risk of the function converging to the local optimal.

2.5. Crossover. Crossover operation is to perform replacement operation on gene-level objects according to certain principles. Generally, the number of individuals used for crossover operation is two, and crossover is mainly performed between two individuals. This ensures the stability of a certain range of genes. It is also different from the original body and a new individual is created. The main purpose of the crossover operation is to generate new individuals for the next generation population, and the newly generated individuals not only contain the genes of the superior parent, but also new individuals with different genes from the parent. Enhance the ability of the algorithm to try globally and improve the possibility of converting the optimal solution. The necessary condition for the crossover operation is that there are two-parent individuals, the output value of the operator is two new individuals, and the genes of these two new individuals come from the parent individuals. This fully simulates the biological reproduction and evolution process.

In the crossover operation, two individuals must be selected according to a certain probability, and then the crossover operation is carried out according to certain rules. The key to the crossover operation lies in the determination of the crossover gene sequence points. Using various gene exchange methods will result in various crossover effects. Commonly used crossover operators include N-point crossover and consistent crossover.

Single-point crossover consists of generating a crossover location at random based on the length of the person, truncating the parent's gene chain at the new crossover site and exchanging the part of the parent gene behind the crossover position to produce two new people.

$$\theta^{e+1} = \theta^e + \frac{\alpha}{|B|}\left(X^B\right)^T\left(X^B\theta^e - y^B\right). \tag{6}$$

A two-point cross is an addition of a cross position based on a one-point cross. The gene chain between the two intersections is truncated. The truncated gene subchain is exchanged, and the non-ontology gene chain is connected between the two intersections to generate individuals with different parents. The crossover points can also be chosen at random using probability.

$$z^{(1)}(k), z_1{}^{(1)}(k) = 0.5X_1{}^{(t)}(k) + 0.5X_1{}^{(1)}(k-1). \quad (7)$$

The principle of consistent crossover is similar to the submask in the network address. The method of setting the mask determines which genes in the individual are inherited and which genes will be exchanged.

$$R(y, \hat{y}) = \sqrt{\frac{1}{n}\sum_{i=1}^{n}\left\|yi - \hat{y}_i\right\|_2^2}. \quad (8)$$

2.6. Mutation Operation. Variations are ripples in the evolutionary history of organisms, albeit small ones that may lead to the emergence of entirely new organisms or organisms that are better adapted to their local environment. In biological evolution, the gene mutation is a small probability event, and the location of gene mutation is random. The working mechanism of mutation is to obtain a number of individuals arbitrarily in the population with a very small probability. It is used to invert a certain gene in the individual with a certain small probability, that is, to change the value of a specific position in the individual, thereby achieving the effect of mutation and generating new individuals.

The mutation operation can introduce new individuals that cannot be generated by the crossover operation. These new individuals may be the genes needed for the optimal solution. This improves the local search ability of the genetic algorithm. When the population search space is large, the appropriate introduction of mutation can improve the efficiency of the algorithm and reduce the risk of early convergence.

$$ab = (a_1 + \cdots + a_n)(b_1 + \cdots + b_n) = \sum_{i=1}^{n}\sum_{j=1}^{n} a_i b_j. \quad (9)$$

In the genetic algorithm, the crossover operation and the mutation operation are both related and different. Crossover operation can search in a large range, and mutation can carry out an individual local search in a small probability way. Genetic algorithm selection, crossover, and mutation operations on genes are the biggest characteristics of its algorithm. It has the ability to carry out the survival of the fittest and repeated evolution of individuals in order to keep and inherit superior genes. It can take into account both global and local spaces, with both global breadth and local detail. The algorithm has a strong ability to search for the optimal solution, and the approximation to the global optimal solution of the problem is relatively fast.

$$\hat{a}_i = \begin{bmatrix} \hat{a}_{i1} \\ \hat{a}_{i2} \\ \cdots \\ \hat{a}_{\text{in}} \\ \hat{b}_i \end{bmatrix} = \left(L^T L\right)^{-1} L^T Y_i. \quad (10)$$

3. Application of Genetic Algorithm in Labor Capacity and Structure Prediction

In this section, the applications of the genetic algorithm based on the labor capacity and structure are discussed. First, the research design of the paper is explained. Secondly, the basic assumption of the paper is discussed, and lastly, the research method of the research paper is elaborated.

3.1. Research Design. This study uses 2010, the sixth census year, as the base year because the population data of the census year will include the number of people at each age, which is more accurate and detailed than other years. First, each age group is used as a group to predict the population of each age in China in the future. After that, the results are based on the existing data, and the regression relationship between the labor supply and the working-age population is obtained. Due to this method, China's future population is predicted. The forecasting process is mainly divided into three steps:

The first step is to predict the working-age population in the future. The basic process of forecasting is as follows:

According to the relevant data of the sixth census report:

(i) Calculate the population of each age in the base period; according to the population sampling survey data of each year

(ii) Predict the average trend value of the mortality rate

(iii) The birth ratio of the newborn population of each age

According to the population Production ratio, calculate the number of newborn people aged 0 in the new year, and combine the population of each age in the previous year to calculate the number of people aged 0 and above in the new year. After calculating the total population and the population of each age in the New Year, the data of one year is continuously calculated to update the data, so as to obtain the population forecast data of the following years.

$$\hat{x}^{(0)}(k+1) = \hat{x}^{(1)}(k+1) - \hat{x}^{(1)}(k). \quad (11)$$

The second step is the regression relationship between the economically active population and the working-age population. According to the population sampling survey data of each year, the regression relationship between the economically active population and the working-age population was obtained. The economically active population is proposed as the dependent variable and the working-age population of each age group as the independent variable.

$$\hat{x}^{(1)}(k+1) = \left(x^{(0)}(1) - \frac{b}{a}\right)e^{ak} + \frac{b}{a}. \quad (12)$$

The third step is to predict the future labor supply based on the results of the first two steps and analyze the age, gender, and quality structure of the labor supply.

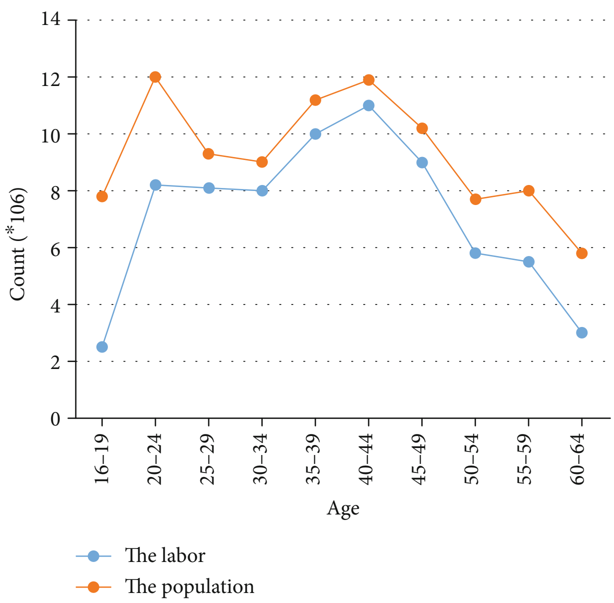

Figure 2: Working-age population structure.

$$\hat{x}^{(0)}(k) + a\hat{x}^{(1)}(k+1) = b. \tag{13}$$

3.2. Basic Assumption. The impact of international population movements is negligible. With the deepening of reform and opening-up, China's population changes are influenced by foreign population inflows and outflows. The impact is limited compared to China's huge population base. In this study, it is assumed that the scale and structure of international population inflows and outflows will remain stable in the future. This predicts that the impact of international population flows on China's total population and structure can be simply ignored.

$$Pc = \begin{cases} \dfrac{k1\left(f_{\max} - f'\right)}{f_{\max} - f_{avg}}, f \geq f_{avg}. \\ k2, f \leq f_{avg} \end{cases} \tag{14}$$

The foothold of this research is to predict the total and structural changes of the future labor supply under the assumption that the existing population, fertility, and education policies remain unchanged. This assumption will provide some inspiration for the formulation of future national macro policies. Therefore, the impact of policy changes is not considered in the research process.

The impact of emergencies such as war and plague is not considered. The impact of emergencies such as wars and plagues on population changes is difficult to predict, so this study does not consider the impact of such emergencies.

3.3. Research Method. Predict the total amount and structure of labor supply by improving genetic algorithm. Based on the fact that the economically active population is a part of the working-age population, the law between the two obtained through observation. We set the economically

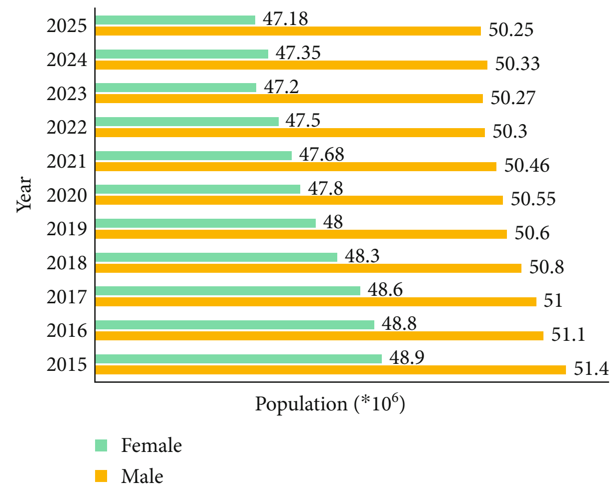

Figure 3: The trend of gender and age structure of the working-age population.

active population as the dependent variable Y. The working-age population is aged 15 to 24, the working-age population aged 25 to 54, and the 55 to 64-year-old working-age population are independent variables X1, X2, and X3, respectively. The regression equation and genetic iteration model between the economically active population and the working-age population are constructed:

$$Y = aX1 + bX2 + cX3 + d + \varepsilon, \tag{15}$$

where a, b, and c are the coefficients of the independent variables X1, X2, and X3, respectively. d is a constant term, and e is a random interference term. Since the economically active population is part of the working-age population, we set a, b, and c to be equal to each other, less than 0, and $d = 0$.

The most recent year of all the existing data available on the website of the National Bureau of Statistics is 2003. We choose the data from 2003 to 2013 as the sample and analyze the data through Eviews 6.0 software. In the process of time-series regression analysis, in order to avoid the problem of sequence autocorrelation and thus affect the fit of the model, each variable is generally required to be a single integral sequence of the same order. Therefore, before carrying out specific regression analysis, we first deal with the respective variables and dependent variables. A unit root test is performed to determine whether the following analysis is reasonable.

The process of testing whether a variable is stable is called a unit root test, and the most commonly used one is the ADF test, which is accomplished through the following three models:

$$\Delta X_t = \gamma X_{t-1} + \sum_{i=1}^{m} \beta_i \Delta X_{t-i} + \varepsilon_t \tag{16}$$

$$\Delta X_t = \alpha + \gamma X_{t-1} + \sum_{i=1}^{m} \beta_i \Delta X_{t-i} + \varepsilon_t \tag{17}$$

Table 1: Improved genetic algorithm for labor capacity and structure experiment simulation values.

No.	Real value	Simulation	Relative error (%)	No.	Real value	Simulation	Relative error (%)
1	13.41	13.41	0	6	9.33	8.07	13.5
2	12.7	13.77	8.66	7	10.13	8.89	12.24
3	11.63	11.05	4.99	8	11.82	11.5	2.71
4	10.35.	10.42	0.68	9	11.47	13.8	16.88
5	9.24	8.07	12.66	Ave. relative error (%) 8.04			

$$\Delta X_t = \alpha + \beta_t + \gamma X_{t-1} + \sum_{i=1}^{m} \beta_i \Delta X_{t-i} + \sum_{i=1}^{m} \beta_i \Delta X_{t-i} \tag{18}$$

where t is a time variable that represents a certain trend of the time series over time. The null hypothesis states that there is a unit root, which is a difference from Model 2. The other two models are whether the constant term or the trend term is included. In the actual test, it is generally carried out in the reverse order of the model. When the test rejects the null hypothesis, that is, the original sequence does not have a unit followed, it is a stationary sequence, when to stop the test, or continue to test until model 2 is tested. If a time series becomes stationary after a difference, the original sequence is called a first-order single integral sequence. It is denoted as I (1). In general, if a time series becomes a stationary series after d differences, the original series is called a d-order single integral series. It is denoted as I (d). Obviously, I (0) represents a stationary sequence.

4. Empirical Research and Data Analysis

The observation and data analysis is a very important phase in the research. In this section, the empirical research and data are analyzed. Firstly, the total labor supply forecast is discussed. After that, the prediction of the gender structure of the working-age population in the future is discussed, and lastly, the prediction of labor culture in the future is discussed.

4.1. Total Labor Supply Forecast. The population of working age is not entirely made up of labor supply. The labor supply, namely, the economically active population, is actually a part of the working-age population. From Figure 2, we can find that in the age group among 25 to 54, the gap between the two is very small and very close, a large number of people in the 15 to 24 age group are in school, and many people in the 55 to 64 age group has or is entering the retirement stage. The gap between the two age groups of 15-24 and 55-64 is relatively large. Figure 2 depicts the number of the working-age population and the economically active population by age in 2010.

4.2. Prediction of the Gender Structure of the Working-Age Population in the Future. Compared with the age of the population, the gender structure of the population is extremely stable. The gender of the working-age population in the following 15 years can be simply calculated using the base period data and the death rate as a factor. In the future, both the male and female populations in China's working-age population will show a fluctuating downward trend, while the female population will decline faster than the male population. The proportion of males and females in the working-age population will show an upward trend in the future. The structure and the calculation results are shown in Figure 3.

4.3. Prediction of the Culture Structure of Labor in the Future. The results of China's sixth census in 2010 showed in Table 1 indicated that 13.41% of the economically active population had never attended school. The 12.7% of the data had primary school education. The 11.66% of the data had junior high school education. The 10.35% of the data had high school education, and 9.42% had a junior college education. The undergraduates accounted for 8.07%, and postgraduates accounted for 9.33%. It can be seen that in China's current labor supply, the labor force with junior high school education still accounts for a large part, and the general quality of the labor remains low.

5. Conclusion

This research paper concludes that improving the genetic algorithm to predict and analyze the capacity and structure of China's future labor and employment, it can be found that the working-age population and the youth population will gradually decline in the future while the elderly population will gradually increase. The ratio will gradually decrease. In addition, the total labor supply in China will peak at about 785 million people before 2020 and then decline year by year. The proportion of total labor supply in the total population will gradually decrease. More importantly, the model predicts that the ratio of men and women in the working-age population in China will further increase in the next 15 years. The average number of years of education in the labor supply will be extended. The labor force with graduate education, undergraduate education, college education, and high school education will increase. The proportion of the overall labor supply with a junior high school education or no schooling will rise, while the proportion of the total labor supply with no schooling will fall.

In application-level scheduling, we use genetic algorithms to minimize the average completion time of jobs through optimal job allocation on each node. The experimental results on the single service model have shown that the scheduling system using the adaptive scheduling algorithms can allocate service jobs efficiently and effectively. In future research, in-depth analysis and expansion of data accuracy can be carried out to improve the accuracy of data. Except for the census year, the data used in this paper are all from the population sampling survey results published by the National Bureau of Statistics every year. The results of population sampling are representative to a certain extent. There will be a certain gap in accuracy compared with the census data. It is likely to cause deviations in the predicted results to a certain extent. In the future, with the advancement of big data and statistical techniques, we can also obtain more accurate results.

Data Availability

The data underlying the results presented in the study are available within the manuscript.

Conflicts of Interest

The author declares that he has no conflict of interest.

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